Headquarters Resource Management Plan
for
Enhancing Environmental Values

2002-2003

October 5, 2001

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Introduction

Resource management planning was introduced in 1998 as a way to link resource management objectives with investment making decision and project selection. The Headquarters Resource Management Plan (HRMP) is the equivalent of the regionally developed Resource Management Plan (RMP).

The HRMP is an inter-agency plan for identifying resource management issues under each Forest Renewal BC Strategic Objective (SO) that is provincial in nature or that support activities in the region.

Headquarters Resource Management Planning

The HRMP Process follows the "spirit and intent" of the SSFM RMP Guidelines. That is, for each Strategic Objective a set of issues, and where applicable a number of sub-issues, were identified which, when resolved based on a well-defined strategy, achieve or contribute to the achievement of the SO's performance measure.

For upcoming fiscal 2002-03, the Enhance Environmental Values (EEV) planning team (Appendix 1) for the Headquarters Resource Management Plan (HRMP) recommends EEV investments to address the key provincial level Issues. This document provides context and rationale for these Issues. Readers interested in going directly to the EEV Issues and Strategies are directed to the EEV Templates 1 and 2 (Appendix 2). On Forest Renewal BC (FRBC) approval of the proposed Issues and Strategies, the planning team will develop details of the required activities.

Forest Renewal BC is committed to an open and transparent planning process. As such, several reviewers from Ministry, Academia and the private sector were selected to provide input and feedback regarding the Headquarters Resource Management Plan for this component. This involved reviewing and commenting on the "Template 1" - Issues and "Template 2" - Strategies. Reviewers were asked to comment on the Issues (Template 1) and Strategies (Template 2) as to their objectives, eligibility and need. The comments and input can be found in Appendix 3.

EEV and FRBC Strategic Objectives

Enhance Environmental Values is one of the six FRBC Strategic Objectives that strive to improve forest management decision making, grow more high-value timber, restore the environment, and enhance the value-added sector (visit *http://www.forestrenewal.bc.ca/*). In addition to EEV, the other Strategic Objectives:

- Sustainable Harvest
- Strengthening Sustainable Forest Management
- Strengthen and Expand the Value Added Sector
- Stimulate Workforce Development to Strengthen the Forest Sector
- Sustain and Diversify Forest Community Economies

Specifically, Forest Renewal BC investments in EEV will assist:

> *"...in restoring forest watersheds and in promoting environmental stewardship and strong environmental values in B.C.'s forests".*

The five-year strategic SSFM target:

> *"Forest Renewal BC will work with its partners to complete the restoration of 20 per cent of the highest-priority watersheds that have been damaged or seriously threatened by past forest development activities".*

HRMP EEV Planning Process

The 2002-03 HRMP SSFM planning process was an inter-agency, collaborative effort of staff from

- Ministry of Forests
- Ministry of Water, Air and Land Protection
- Ministry of Sustainable Resource Management

The EEV HRMP planning process began in June 2001 and comprised team meetings to identify the Key EEV Issues. Several issues were identified and leaders were identified to document issues. One main issue was subsequently developed from the initial meeting.

The EEV planning team provided input on several iterations of the Issues and Strategies templates before a wider technical peer review by agencies and SSFM stakeholders (Appendix 4). Following the technical review, the EEV template information was modified to reflect peer review comments and suggestions.

Documents guiding the headquarters planning process included:

- HRMP Guidelines
- HRMP/HIP Ground Rules
- 2002/03 Resource Management Plan Guidelines
- 2001/02 Resource Management Plan

Summary

To the best of the component leader's ability, comments were rationalized and incorporated into the Template submissions. In general, the comments received fell into one of three categories as follows:

- **editorial** – required wording change
- **required specific change** – specific wording or additional ideas were incorporated
- **required no change** – comments of general nature which required no change

Not all of the editorial comments have been documented (such as editorial or those that required no change) but have been addressed where required. Based on the reviewers' comments, templates have been reviewed and revised.

Appendix 1 – Planning Team

HRMP Team for Enhancing Environmental Values

Name	Agency	Branch/ Section
Dave Bodak	MoF	Forest Sector Initiatives Section
Don Gosnell	MWLAP/MSRM	Forest Renewal Management Br.
John Mallet	MoF	Resource Tenures & Engineering Branch
Brendan Holden	MoF	Resource Tenures & Engineering Branch
Glenn Moore	MoF	Resource Tenures & Engineering Branch
Pat Slaney	MWLAP	Forest Renewal Management Br.

MoF Ministry of Forests
MSRM Ministry of Sustainable Resource Management
MWLAP Ministry of Air, Land and Air Protection

Appendix 2 – EEV Templates

Knowledge Issues and Strategies Templates #1 and #2

TEMPLATE 1: HRMP EEV Issue

Strategic Objective: FRBC Strategic Objective – Enhancing Environmental Values (EEV)	
Issue # 1	**Title: Are watershed restoration works achieving the desired environmental value / outcome and in a cost-effective manner?**
Sub-issue # (N/A)	**Title: N/A**

Overview Description of Key Provincial Level Issue:

FRBC's strategic objective of enhancing environmental values (EEV) focuses on implementing and completing watershed restoration activities in 20% of the priority key watershed units (target watershed units) within each region by March 31, 2004. A key provincial level issue that is preventing or limiting the achievement of performance targets and measures associated with this strategic objective is the high level of uncertainty about the answers to three fundamental questions regarding the state of recovery of watershed units:

1. Is the restoration work under the Watershed Restoration Program (WRP) achieving the objectives for the targeted environmental resource values including domestic water quality/supply and fish habitat?
2. Given limited funds, how can watershed restoration techniques be improved and risk management principles be consistently applied to optimize recovery of the targeted resource values?
3. What modifications are needed to the program to ensure that funds are directed towards the most cost-effective restoration works for the targeted resource values over the expected life of these works?

To answer the above questions and thereby resolve the uncertainty, an effectiveness evaluation program coupled with an adaptive management framework should be implemented for the WRP.

Relationship of Key Provincial Level Issue to Strategic Objective:

Addressing this key provincial level issue will help to:

1. Maximize effective and efficient restoration of domestic water quality/supply and fish habitat values that have either been lost or damaged, or that are at high risk of being damaged, by past forest harvesting practices. To hasten recovery of logging-related resource impacts, "restoration" activities typically focus on altering the rates of processes that control the physical and biological structure and function of watersheds. For example, conducting road deactivation, landslide and gully rehabilitation projects reduces the generation and delivery of sediments from hillslopes to stream channels and re-establishes natural drainage patterns and water quality/supply. Also, replacing lost channel-structuring elements within streams and off-channel habitat areas, increasing the integrity of riparian areas, and improving conditions for fish passage, accelerates the recovery of biological function within the flood plain, riparian areas and stream channels, and increases the amount and quality of fish habitat.
2. Maximize achievement of environmental stewardship values by partnering with agencies, stakeholders and MYA consultants on projects, retaining technical/scientific support, and transferring lessons learned via on-site mentoring, workshops and technical publications.

Relationship of Key Provincial Level Issue to Strategic Resource Plans and Decisions:

Regional resource management plans (RMPs) identify local restoration challenges and establish watershed restoration priorities. The restoration treatments in watershed units are primarily focussed on addressing declining coho salmon, steelhead, and resident fish stocks, and impaired water quality within community watersheds. Addressing the key provincial level issue described herein will maximize opportunities to (1) develop and use new knowledge and tools for watershed restoration and (2) facilitate development of more effective RMPs, restoration plans and prescriptions by:

- allowing more efficient allocation of funding and optimization of planning/decision making
- providing a process for data collection to permit a measurement of the state of recovery of priority key watershed units to form the basis for ending, or continuing, investment in each watershed unit
- encouraging technical feedback to refine restoration treatment designs.

Cross Reference to other Key Provincial or Regional Level Issue or sub-issue (if applicable):

Regionally Significant Issues:

Watershed restoration activities are required in target watersheds to address the following damage or potential damage to environmental values caused by past logging:

- **Unstable Hillslopes:** Past logging practices have resulted in numerous cases of uncontrolled landslide, erosion and sedimentation hazards associated with unstable non-status roads, landslide scars, altered natural drainage patterns, and unstable gullies. These hazards threaten damage to sensitive aquatic areas such as fish habitat and or water quality in community watersheds.
- **Loss of Floodplain and Riparian Functions:** Past logging of floodplain areas and particularly riparian zones has had a significant impact on alluvial streams through reduction of rooting strength and bank stability, and large wood recruitment to the channel. In many cases there has been bank erosion, channel widening and reworking of floodplain sediments. This has resulted in habitat loss and degraded water quality from eroded floodplain fine sediments. Medium to long term recovery of damaged alluvial channels requires re-establishment of riparian and floodplain forest.
- **Damaged Stream Channels, In-stream and Off-channel fish habitat:** Mid-/south coast and interior coho salmon and steelhead stocks have declined substantially over that of 1-2 decades ago. Some anadromous fish stocks are considered at risk of extirpation (complete destruction) including Georgia Basin Steelhead and Thomson-Shushwap Coho. Resident fish stocks at risk include most northern Arctic grayling and many southern to central to northern interior bull trout stock. While past over fishing (resolved in1998) and poor ocean survival have been key factors, habitat damage from past logging practices continues to result in aquatic habitat degradation and losses. With restoration of unstable hillslopes and damaged channels, the recovery of in-stream and off-channel fish habitat can be greatly accelerated which in turn can help to preserve stocks at risk and regain stock productivity in freshwater. Fish passage problems at locations where structures on forest roads cross fish streams need to be identified and suitably addressed. Degraded water quality from stream bank and bar erosion and loss of habitat has placed some stocks at risk of extirpation. Thus, restoration of riparian and channel functions typically involves activities to address the following types of damage:
  - riparian damage (vegetative species shifts, overstocked immature riparian stands)
  - channel instability (loss of fluvial energy resistive root strength and channel widening)
  - loss of fish habitat (from sediment in-filling, loss of large wood, cut-off fish access, and reduced nutrient influx).

The restoration techniques used to address the above problems should be evaluated and adjusted to reflect new information and actual outcomes that may differ from the desired watershed and component level objectives. Addressing the key provincial level issue described herein through the application of a passive and active adaptive management approach will provide the regions with essential information to plan, design, and carry out on-the-ground restoration activities. This approach will provide the regions with:

- reliable feedback about whether or not watershed, component and site level objectives are being met
- opportunities for improved management of the WRP delivery mechanism
- opportunities to learn from successes and failures, and to accommodate change.

TEMPLATE 2: HRMP EEV Issue Strategies

Key Provincial Issue # 1	**Title: Are watershed restoration works achieving the desired environmental value / outcome and in a cost-effective manner?**
EEV Issue #	**Title: Effective and Efficient Watershed Restoration in EEV**

Overview Description of the Strategy to Address the Key Provincial Issue:

The strategy to address the key provincial level issue involves more effective use, communication and documentation of existing technical information and project results, but most emphasis is placed on the collection, communication and documentation of new technical information and project outcomes, all of which have regional significance.

Status of Existing Knowledge:

The status of existing knowledge in this area is as follows:

1. Organization/synthesis/analysis: Restoration procedural standards, guidelines and technical literature (e.g., Schedule A Standards, technical circulars, handbooks, management reports, project reports, videos, Streamline bulletin) are currently available for most but not all restoration and rehabilitation techniques. For some techniques, technical guidelines have not been well developed past the prescriptive stage, and are not well tested or evaluated for effectiveness (for example, slope soil bioengineering, riparian treatments, restoration of de-stabilized channels). Currently, there are weak standards for risk assessment and this raises concerns that the best option or correct prescription for site restoration works may not always be implemented. Furthermore, the benefits of prescriptions that are developed using a "structural form" approach, or "physical function / natural process" approach, need to be examined and communicated.
2. Data Management: Analytical methodologies, tools and capability are presently limited to site assessment of adverse effects on environmental values and development of restoration prescriptions to address observed damage or potential threat of damage. However, few techniques and approaches to site analysis have been verified or documented as methods to accelerate recovery of watershed units. For example, the application of conventional silvicultural treatments in riparian restoration such as thinning dense immature stands may or may or not apply to all sites such as small channels (less than 15 to 20 m channel width) and may not restore all riparian functions. In another example, there are wide knowledge gaps in slope soil bioengineering phases such as site assessments, prescription development, and plant selection, harvesting and handling of living plant materials, plant care, installation methods, and on-site supervision of soil bioengineering construction installations.
   In the case of some projects, knowledge gaps in these and other areas have resulted in the completion of unnecessary work or failed structures at high cost with little or no benefit. Because there has not been a concerted effort to implement an adaptive management framework for the WRP, the management of data to date has been less than satisfactory for effective communication of lessons learned, efficient allocation of funding and optimization of planning/decision making.
3. Research: Research has established the cause of adverse effects on environmental values (for example, Fish/Forestry interaction studies) and identified conventional restoration treatments, but there have been no formal, coordinated approach to testing innovative refinements to these techniques.

   Further guidelines need to be developed using available research results to better define critical limiting factors to fish production to achieve effective and efficient prescriptions.
4. Adaptive Management: An adaptive management process for the WRP is not currently being implemented to an effective level.
5. Effectiveness Evaluation: To date, effectiveness evaluations of restoration projects have mostly

been limited to routine ranking with descriptive photo-documentation of specific site applications at a very small scale. To date, there has been insufficient documentation regarding the effectiveness of treatments, and many times any available documentation is limited in value. For example, interactive workshop modeling may be needed to resolve the silvicultural thinning issue, based on riparian-channel structure modeling research of Beechie et al. 2000 (in press). In a second example, it is apparent that some slope soil bioengineering applications are not suitable for every site, and lessons learned from soil bioengineering successes and failures have not been widely communicated.

6. Extension: Current information on assessment of adverse effects on environmental values caused by past harvesting practices is published in WRP technical circulars available at the following website: **http://www.elp.gov.bc.ca/frco/bookshop/tech.html.** With regards to development of prescriptions and implementation of on-the-ground work for some restoration treatments, there is poor documentation and communication of good practices. For example, there is a crucial need for on-site mentoring during prescription development and major works to advance rehabilitation and accelerate recovery of de-stabilized stream reaches from past streambank/riparian logging. Publications are available on how to carry out overview assessments and generic prescriptions for riparian projects. But additional technical literature needs to be developed to provide guidance to practitioners on how to make more detailed site prescriptions based on state-of-the-art silvicultural channel process modeling.

Describe the Required Activities in these Areas (as applicable):

1. Organization/synthesis/analysis: To increase the level of analysis capability, the following activities are proposed in every region:
   - Three levels of effectiveness evaluation of hillslope and aquatic prescriptions (routine, intensive and operational techniques refinement) will be conducted.
   - Detailed guidelines will be developed that will outline how to carry out these effectiveness evaluation projects. The guidelines will include instructions on how to carry out the following activities: selection of field monitoring indicators to help determine whether WRP objectives are being met; field inspections of completed project works; evaluation and documentation of results; development of new or improved prescriptive specifications, standards and guidelines; delivery of interactive workshops and mentoring programs; and effective communication of results including technical communications products to capture and disseminate new information, tools and innovations.
2. Data Management: To improve the level of knowledge in restoration techniques, important site data will be collected, recorded and evaluated following project completion as part of an adaptive management process. This data will be collected in a standard format and saved in an electronic medium to build a WRP knowledge base, and will be synthesized to help plan and decide how the WRP will be adjusted based on what is learned. The data will be updated as learning progresses. Public access to the individual study deliverables will be provided through a searchable web format as well as hardcopy in the form of an annual compendium reference publication.
3. Research: Management experiments involving practical, short to mid-term effectiveness evaluations for hillslope, in-stream, off-channel fish habitat, and riparian treatments will be conducted to address knowledge gaps and improve chances to accelerate recovery of de-stabilized watershed units.
4. Adaptive Management: An adaptive management process for the WRP will be implemented at both a project and program level, involving the following six steps: assessment, design, implementation, monitoring, evaluation, and adjustment.
5. Effectiveness Evaluation: Restoration techniques and projects will be evaluated and adjusted to reflect new information and actual outcomes that may differ from the desired watershed and component level objectives. Some of this work is experimental, such as channel bar

stabilization on streams where the hydraulics and physical / morphological characteristics and processes of the channel are compatible with this type of treatment, and stream nutrient enrichment. Independent practitioners who are not otherwise associated with the works will undertake some portion of the effectiveness evaluation.

6. Extension: The lessons learned from effectiveness evaluation projects will be rapidly communicated to all practitioners. To communicate lessons learned, interactive workshops and mentoring programs will be delivered, and technical communications products will be developed to capture and disseminate new information. The sharing of information will provide practitioners with an opportunity to learn and change how on-the-ground restoration works are planned, designed, implemented and evaluated.

Define Performance Indicators, Targets and Milestones:

The collection of the following four strategic activities (identified in Template 3) will build the knowledge required to achieve the strategy to resolve the key provincial issue:

1. Mitigate Upslope Sediment Production: How can we standardize risk estimation procedures in sediment source and slope stability assessments to identify the highest risk problem and to select the most cost effective treatment? Is the prescribed treatment appropriate for the site to minimize sedimentation? (e.g., over prescription versus under prescription)
2. Mitigate Riparian Functions: How can we ensure that riparian prescriptions are appropriate to address water quality, fish and wildlife habitat cost effectively?
3. Mitigate Lost Channel Functions: How can we ensure that the prescribed treatment is appropriate, feasible and cost effective for the stream reach?
4. Resolve Program Level Constraints: How can we optimize use of existing knowledge? (e.g., get available knowledge to the practitioners). How can we improve and confirm effectiveness of restoration strategies? How can we ensure that standards and contracts ensure the quality of the work meets watershed objectives?

The following performance indicators, targets and milestones will be used to monitor the progress toward achieving the above strategic activities and associated questions:

Performance Indicator: Number or percentage of REE projects that are evaluated

Target: To be developed based on available budget

Milestone:
--Evaluation plan in place by April 1, 2002
--Contracts in place by June 1, 2002
--Results received by February 1, 2003
--Database populated by April 1, 2003
--Selected recommendations for adjustment published by August 1, 2003

Performance Indicator: Number or percentage of IEE projects that are evaluated

Target: To be developed based on available budget

Milestone:
--Evaluation plan in place by April 1
--Contracts in place by June 1, 2002
--Results received by February 1, 2003
--Database populated by April 1, 2003
--Selected recommendations for adjustment published by August 1, 2003

Performance Indicator: Number or percentage of OTR projects that are evaluated

Target: To be developed based on available budget

Milestone:
--Evaluation plan in place by April 1
--Contracts in place by June 1, 2002
--Results received by February 1, 2003
--Database populated by April 1, 2003
--Selected recommendations for adjustment published by August 1, 2003

Performance Indicator: Successful Implementation of an Adaptive Management Feedback

	Loop
Target (OUTPUT):	Annual compendium publication, web site, workshops (influenced by previous year's evaluation data)
Milestone:	--Annual compendium published within 12 months after completion of EEV projects --Web site updated monthly --Minimum of one workshop in the winter / spring period of each fiscal year

Describe Relationship to Other Strategies (if applicable):

For the following reasons, a plan for a staged and long term funding commitment is required to successfully implement the Strategy to address the key provincial level issue:

- The recovery rate of natural processes that control the physical and biological structure of watersheds is slow and lengthy.
- The scope, location and timing of component restoration activities, including the priorities for implementing restoration works (based on risk of damage to target resource values), is unique for each watershed; this reflects differences in physiography, climate, geology, intensity of past development, and inventory of adverse impacts on the environment.

Cross Reference Activities to Other Strategies (if applicable): Not applicable

Appendix 3 – Reviewer Comments

Enhancing Environmental Values Reviewer Comments

These two templates are designed to have a provincial wide application. As such they have to be in general terms. However they may be so broad as not to achieve anything new and just add another layer of beaurocracy onto the system. It seems that coastal concerns are driving the objectives ie. Strategic Objective 1 does not appear to include barrier removal to provide access to habitat, although this is a serious consideration in this part of the Interior.

EEV Key Issue 2: I agree that there is a need to be able to answer the 3 listed questions. However it should be tackled in a carefully thought out manner to ensure that the costs of monitoring restoration works and researching techniques etc. are also well spent. Although there is an issue regarding ensuring that restoration works are achieving the desired outcome and being carried out in a cost effective manner, planning, risk management and effective priority setting are also seen as key to the success of WRP.

I am not familiar with the definition of the "Ministry mandate". It would be helpful to know what it is and where it is stated. In my view the 6 activities listed as a part of the strategy to resolve Issue 2 would be eligible for funding because the works being carried out are deemed incremental so the monitoring should also be incremental to legislated responsibilities. To be wholly objective some portion of the review will have to be undertaken by independent 3rd parties. Monitoring & Research Activities should be clearly defined and have a cost ceiling as is currently proposed.

Where the Ministry, on behalf of the government, adopts a no or minimum risk policy, works may be undertaken that are of limited value unless exceptional circumstances occur. (However in the event of that exceptional occurrence they would prove of value). Industry is more inclined to risk manage situations. This results in a perception that in order to meet the requirements of the prescription and works Standards Agreements, more intensive works are carried out than are really necessary. As there are budget limitations, this results in fewer areas being treated. I am too close to this to be objective about whether the current situation is providing best return on investment, but I can say that efforts are made to keep the costs down within those constraints.

I agree with the strategies proposed for Issue 2.
1 Up-front guidelines of what is required are useful and necessary, but there needs to be a balance between rigid standardization and flexibility to cover different situations.

2, 3, 4 & 5 No additional comment

6 I have benefitted from the FRBC sponsored courses I have taken on WRP activities and feel that they are well worthwhile, as are the FRBC sponsored WRP workshops, both for their content and for the contacts that can be made. I feel that a workshop held every 2 years, specifically for the Interior, would attract most participants in the field and is not so frequent as to split attendance. (Coastal problems are to a significant extent different and I feel both areas are better served by separate workshops). Technical publications are necessary for standardization of approach, measurability and as a reference source. However they are rarely as memorable as a good presentation, so we need both. Binder formats are easily updated and the new sections can be

downloaded and inserted. If we are truly moving towards adaptive management I see this as the way to go. Having written up the Compendium Reports for our FRBC fish access activity and a trial of the new REE forms, I believe it was worthwhile since it will enable information to be disseminated more widely than happened in the past. Again as part of an adaptive management process, lessons learned need to spread as widely as possible.

Being involved late in this process, some of my comments below may be uninformed, but my hope is that these will help stimulate discussion.

In terms of maximizing effective and efficient restoration of damaged resources, I think there is a considerable uncertainty regarding the detailed extension of the EEV RMP - specifically the restoration plans. One of the highest levels of uncertainty regards the "critical limiting factors to fish production". While it's reasonable to consider that these will vary widely among watersheds, there is little evidence to confirm that they have been correctly determined. I think this is an issue that relates directly to how the EEV SO is defined, and how the targets will be met.

On another note, I find that the emphasis on restoration of community watersheds is underweighted. There doesn't appear to any uncertainty identified for water quality; yet this speaks volumes to how much is known about restoration of domestic water supplies.

Re Template 1, "Overview description . . .", I don't think the issue is about improving the cost effectiveness of restoration work as much as it is what are the most cost effective measures for restoration work that are currently practiced. For example, how are tradeoffs made between culvert replacement, backwater channels, and riparian tree thinning? Which are the most critical, and therefore the highest priority? One way to include this issue in Template 1 would be to change the wording in 3. from "What modifications are needed . . . " to "What modifications are needed to ensure that funds are directed towards the most cost-effective work for the target resource?".

I think that restoration of natural drainage paths, for consideration of potential channel alterations resulting from peak flow changes, needs to be included in equal importance to hillslope stability. I think the damage to stream channel structure, which WRP endeavors to address, starts with restoration of hillslope hydrology. This could be added to the section, "Relationship of Key . . . " in Template 1.

I think these templates need to provide better focus to be effective. One of the underlying realizations leading to the restructuring of WRP in 1998 by modifying the eligibility criteria (an other things) was that the program was trying to accomplish all things for all people. These templates appear to exhibit the same all-encompassing approach. In a multivariate system, it's rare that all variables can be maximized or minimized. Most of the time, extrema in one or two variables can be achieved, with the remainder measuring up to a lesser degree. So, I question whether the terms, maximize and minimize, will allow much conclusion if these templates are used to audit performance.

I would like to see more emphasis on the protection and maintenance of fisheries and water quality, consistent with the new goals of WRP.

In Template 1 under "Cross Reference to other . . . ", the reference to endangered resident spp. appears out of place. I am unclear why these are mentioned, without the commensurate inclusion of anadramous spp.

In this same template, an implicit assumption exists that if form is restored then so is function. I think there is a lot of uncertainty that this is indeed the case. Could this template provide some context for examining these relationships where they exist?

Reading this stuff makes my brain hurt!

As it is, the proposed format is too full of jargon and regurgitation of strategic objectives and policy.

The two templates should be simplified to:

1. Identification of the issue, issue number, priority, etc.
2. A description of the perceived problem.
3. How a solution to the problem would result in improvements to enhancing environmental values program delivery.
4. Steps to be taken to find a solution to the problem (which should include specific deliverables, a time line and cost estimate).

This is all the information that is required if the entity adjudicating the proposal is competent.

Watershed Restoration: Adaptive Management: In stream Evaluation

The premise of all watershed restoration activities is to restore the watersheds to some level of ecological functionality that existed prior to forest harvesting activities. Restoration activities such as hill slope deactiviation can be relatively easily evaluated, as the scientific, engineering and technology of these activities is relatively mature, and can be easily evaluated through aerial or ground surveys.

The same cannot be said for the restoration of aquatic resources. Much of the ecological knowledge has been gained relatively recently (i.e., the incorrect "requirement" to remove large woody debris from stream up to the 1960's), to the recent (i.e., 2000+) understanding of the linkages between large woody debris, nutrients, anadromous salmonids, terrestrial vertebrates and the riparian forest.

Somehow the impression has been generated among bureaucrats that because the upslope road and hill side deactivation work is so clearly definable, and more easily evaluated, that restoration of aquatic resources falls into the same category. This assumption is clearly false, and results in an incorrect approach to watershed restoration. The failure to properly address the effectiveness of the aquatic restoration activities negates the immediate investment of time and resources spent on the hill slope and riparian restoration activities, and forgoes the future monetary and non-monetary benefits that would accrue from successful restoration procedures. For example, the US Forest Service has spent millions on road deactivation, riparian silviculture, but has not investigated the role of nutrients from anadromous salmon in rebuilding this stream and river fish and terrestrial vertebrate communities. This omission, will likely negate many of the benefits they should have derived from the hill slope *and* in-stream works, and result in some cases, result in a failure to restore anadromous salmonid runs, and the resulting impacts to terrestrial vertebrate communities that depend on salmon (e.g.. grizzly bears).

Given the complexity of the ecological world, the best approach to resolving this issue to use Adaptive Management, developed at UBC by Dr. Carl Walters and Buzz Holling, in which a sufficient level of monitoring is allocated to a project, so that the information collected is used to modify/improve the effectiveness of a particular management option over time, or to terminate the activity is it is clearly shown to be a failure. This "learning by doing" approach is likely the only way to effectively evaluate

new and innovative aquatic restoration activities due to the complexity, lengthy time horizons and underlying linkages in aquatic ecosystems.

In the field of nutrient replacement, which is turning out to be an important factor limiting the recovery of salmonid populations resources of coastal BC streams and rivers, the science is so recent that there is considerable research and development to be done. Thanks to funding from FRBC/WRP, staff of MWLAP have advanced BC's knowledge of this issue to the forefront of current scientific knowledge, and are well positioned to continue refining the ecological and cost effectiveness of one of the most powerful aquatic restoration techniques. Note that stream nutrient enrichment is only a temporary measure until the stream and adjoining riparian area, and upslope community stabilize, and salmonid runs rebuild themselves such that external sources of nutrients are not required. Thus by allocating resources to more cost-effectively restore stream and river productivity, the end benefit will be a long term reduction in costs associated with this activity as the ecosystem returns to a normal state of functioning.

The present Government has indicated it requires a science and ecosystem-based approach to resource management. Neither of these strategic approaches are possible without and adequate funding to develop and properly evaluate aquatic restoration activities.

Appendix 4 – Technical Peer Review

Below are three lists of reviewers for the EEV component. Those who responded are also identified.

HRMP Peer Review - Enhancing Environmental Values

Name	Affiliation	Response
Terry Powell	Pope & Talbett	
Val Duffin	Weldwood	Yes
Warren Wartig	Interfor	
Paul Marquis	MoF WRP Coordindator	Yes
Ernie Carson	MoF WRP Coordindator	Yes
Tim Silbernagel	MoF WRP Coordindator	
Bruce Mcfarlane	MoF WRP Coordindator	Yes
Howard Debeck	MoF WRP Coordindator	
Dan.Hogan	TREWG	
Heather Deal	TREWG	
Pat Slaney	MoF	Yes
Prof. Rob Millar	UBC Engineering	Yes
Ken Ashley	Section Head with Fisheries Research/Fisheries Branch	Yes

MoF WRP Ministry of Forests, Watershed Restoration Program
UBC University Of British Columbia
TREWG Technical Review and Evaluation Working Group